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DEPARTMENT SOFTWARE **ENGINEERING**

SECTION B

PAPER LINEAR ALGEBRA

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Answer No 1:

$$\begin{bmatrix} 1 & 1D3 & 3 & 0 & 5 \\ 0 & 1 & -1Dlast & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 1D3 \end{bmatrix}$$

Solution:

$1D3 = 2$

$-1Dlast = -4$

$$\begin{bmatrix} 1 & 2 & 3 & 0 & 5 \\ 0 & 1 & -4 & 0 & 7 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix}$$

multiplying Row three by 4 and then add to Row two.

$$\begin{bmatrix} 1 & 2 & 3 & 0 & 5 \\ 0 & 1 & -4+4 & 0 & 7-24 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix} \quad R_2 + 4R_3$$

P#2

$$\begin{bmatrix} 1 & 2 & 3 & 0 & 5 \\ 0 & 1 & 0 & 0 & -17 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix}$$

Now multiplying Row two by "-2" and then add to Row one.

$$\begin{bmatrix} 1 & 2-2 & 3 & 0 & 5+34 \\ 0 & 1 & 0 & 0 & -17 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix} \quad R_1 - 2R_2$$

$$\begin{bmatrix} 1 & 0 & 3 & 0 & 39 \\ 0 & 1 & 0 & 0 & -17 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix}$$

Now multiplying Row three by "-3" and then add to Row one.

P#3

$$\begin{bmatrix} 1 & 0 & 3-3 & 0 & 39+18 \\ 0 & 1 & 0 & 0 & -17 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix} R_1 - 3R_3$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 57 \\ 0 & 1 & 0 & 0 & -17 \\ 0 & 0 & 1 & 0 & -6 \\ 0 & 0 & 0 & 1 & 2 \end{bmatrix}$$

So this is the final ~~linear~~ Augmented matrix

$x_1 = 57$ $\quad x_2 = -17$ $\quad x_3 = -6$ $\quad x_4 = 2$

Verification:

$x_1 + 2x_2 + 3x_3 = 5$

putting values

$57 + 2(-17) + 3(-6) = 5$

$57 - 34 - 18 = 5$

$57 - 52 = 5$

$5 = 5$ $\longrightarrow$ true

Now

P# 4

$x_2 - 4x_3 = 7$

$-17 - 4(-6) = 7$

$-17 + 24 = 7$

$7 = 7 \rightarrow$ true

Answer No 2:-

Part A:-

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{bmatrix}, \begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

Solution:

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first into second :

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{bmatrix}$$

multiply Row two by "-2" and then add to Row three

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2-2 & -5+8 & -1-4 \end{bmatrix} R_3 - 2R_2$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

So this is matrix two.

Second Matrix into first.

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0 & 3 & -5 \end{bmatrix}$$

multiply Row two by "2" and then add to Row one.

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 0+2 & -8+3 & 4-5 \end{bmatrix} R_3+2R_2$$

$$\begin{bmatrix} 1 & 3 & -1 & 5 \\ 0 & 1 & -4 & 2 \\ 0 & 2 & -5 & -1 \end{bmatrix}$$

So this is the first matrix.

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Answer No 2

Part B:

(a)
$$\begin{bmatrix} e & 0 & 0 & 0 \\ 0 & \pi & 0 & 0 \\ 0 & 0 & -\pi & 0 \\ 0 & 0 & 0 & e \end{bmatrix}$$

Solution:

it is in echelon form because it satisfies all the following conditions:

(1) All the entries in a column below a leading entry are zero.

(2) Each leading entry of a row is in a column to the right of the leading entry of the above row.

(3) To satisfy the 3rd condition there is no

zero-row which should be below the all non-zero rows.

(b) $\begin{bmatrix} 1 & 0 & \pi \\ 0 & 1 & e \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$.

it is in reduced echelon form because it is already in echelon form and satisfy the further two conditions.

(1) All the leading entries in the non-zero rows are 1.

(2) Each leading 1 is the only non-zero entry in its column.

(c) $\begin{bmatrix} 5 & 0 & 0 & 7 \\ 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 4 \end{bmatrix}$

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Answer C:

it is in echelon form because it satisfy all the following conditions-

(1) All the entries in a column below a leading entry are zero.

(2) Each leading entry of a row is in column to the right of the leading entry of the above row.

(3) To satisfy the 3rd condition there is no zero-row which should be below the all non-zero rows.

(d) $\begin{bmatrix} 1 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 4 \end{bmatrix}$

it is neither in echelon form nor in reduced echelon form because it doesn't satisfy the following condition.

(1) All the zero rows are below the non-zero rows.

Answer No 3

Part A.

The difference between echelon form and reduced echelon form are given below.

echelon form :

A rectangular matrix is in echelon (or row echelon form) if it has the following.

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three properties:

(1) All non-zero row are above any rows of all zeros.

(2) Each leading entry of a row is in a column to the right of the leading entry of the row above of it.

(3) All entries in a column below a leading entry are zeros

Reduced Echelon Form:

if a matrix in echelon form satisfies the following additional conditions, then it is in reduced echelon form (or reduced row echelon form).

(1) The leading entry in each non-zero row is 1.

(2) Each leading 1 is the only non-zero entry in its column.

Answer No 2:

Part B:

$$\begin{bmatrix} 1 & 1D2 & 8 \\ 2 & 8 & -1 \\ -1D3 & 0 & 0 \\ 1 & -4 & 10 \text{ first-last} \end{bmatrix}$$

Solution:

P#13

$ID = 16284$

$ID2 = 6$

$-ID3 = -2$

ID first - last = 14

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -2 & 0 & 0 \\ 1 & -4 & 14 \end{bmatrix}$$

multiply Row four by "2" and subtract Row two from Row four.

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -2 & 0 & 0 \\ 0 & -16 & 29 \end{bmatrix} 2R_4 - R_2$$

Now add Row ~~three~~ two ~~an~~ to Row three.

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$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ 0 & 8 & -1 \\ 0 & -16 & 29 \end{bmatrix} \quad R_3 + R_2$$

Now multiply Row three by two "2" and then add to Row 4.

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ 0 & 8 & -1 \\ 0 & 0 & 27 \end{bmatrix} \quad R\cancel{0}4 + 2R_3$$

Now subtract Row two from Row three.

$$\begin{bmatrix} 1 & 6 & 8 \\ 2 & 8 & -1 \\ -2 & 0 & 0 \\ 0 & 0 & 27 \end{bmatrix} \quad R_3 - R_2$$

Now add Row three ~~too~~ to Row two.

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$$\begin{bmatrix} 1 & 8 & 8 \\ 0 & 8 & -1 \\ -2 & 0 & 0 \\ 0 & 0 & 27 \end{bmatrix}$$

Now multiply Row ~~three~~ two by (-3) and then subtract from 4 times of Row one.

$$\begin{bmatrix} 1 & 0 & 35 \\ 0 & 8 & -1 \\ -2 & 0 & 0 \\ 0 & 0 & 27 \end{bmatrix} \quad 4R_1 - 3R_2$$

Now multiply Row one by "2" and then add to Row three.

$$\begin{bmatrix} 1 & 0 & 35 \\ 0 & 8 & -1 \\ 0 & 0 & 70 \\ 0 & 0 & 27 \end{bmatrix} \quad R_3 + 2R_1$$

P# Last.

Now multiply Row three by "-2" and then add to 5 times of Row "4"

$$\begin{bmatrix} 1 & 0 & 35 \\ 0 & 8 & -1 \\ 0 & 0 & 70 \\ 0 & 0 & -5 \end{bmatrix} 5R_4 - 2R_3$$

Now Multiply Row four by "14" and then add to Row three

$$\begin{bmatrix} 1 & 0 & 35 \\ 0 & 8 & -1 \\ 0 & 0 & 0 \\ 0 & 0 & -5 \end{bmatrix} R_3 + 14R_4$$

Now interchange R3 into R4.

$$\begin{bmatrix} 1 & 0 & 35 \\ 0 & 8 & -1 \\ 0 & 0 & -5 \\ 0 & 0 & 0 \end{bmatrix} R_3 \leftrightarrow R_4$$

this is required echelon form.

(End)